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AVAILABILITY IMPROVEMENTS IN VEPCO NPPs

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MANAGEMENT INVOLVEMENT

I have two fundamental observations to make. The first observation is based on our company's more than 20 years experience in building and operating nuclear plants. We started construction of our first unit in 1968 and have been operating four units at two power stations for nearly ten years. Our last unit to go into operation, North Anna Unit 2, was the first unit to start up following a licensing moratorium after the Three Mile Island accident. This first observation, then, is simply that dramatic improvements in nuclear performance are possible given sufficient management commitment.

And the second observation is based on our very recent experience, and that is that no nuclear operator having achieved high levels of performance can afford to relax or grow complacent.

Earlier at this conference we have heard on numerous occasions that improvement or the pursuit of improvement must be constant. Excellence in nuclear opportunity, somebody said, is a journey, not a destination, and it is important that first management must believe that fact very strongly. There is no time to relax and be complacent. After management believes these thoughts, then they must be communicated to our workers at our nuclear stations very clearly.

Virginia Power has a solid nuclear program, one that despite occasional problems has gained us the respect of the public and we believe our peers. Since 1980, we have gone from average capacity factors for four units from below 50% to over 75% in 1985 and 1986. Significant events at both our Surry and North Anna Power Stations in 1987 lowered our capacity factor again to 63%. Neither of these events was foreseeable, in our opinion, and also in the opinion of the Nuclear Regulatory Commission. We handled both problems quickly and employed the lessons learned to improve the operations. You might remember that right at the end of 1986, a Surry Unit suffered the feed rupture which lead to the tragic death of four workers, and then just six months later a North Anna unit suffered a tube rupture due to high cycle fatigue. Operation at both stations has returned to normal since then, and at the beginning of 1988, we were looking for a very good year. In September, however, a succession of unrelated problems at our Surry Station lead us to shut down both units voluntarily in order to fully examine both the individual events and the overall operations at the station. These units remain shut down, although both we expect to come back on-line very soon.

Despite Surry's problems, our nuclear operations had a good year overall in 1988. Our North Anna Station recorded a 92% capacity factor and our system

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capacity factor was 71%. This again is well above the US national average. Our North Anna Unit 2, when we shut it down in February for refueling, had operated some 372 days continuously and has achieved 3 years of operation without an automatic unit trip. Now that's indicative of a solid program, and today, first, I would like to speak about how we built that program after being a substandard performer all during the 1970's, and then secondly I would like to speak a little bit about the adjustments we are making based on the recent events of this past fall.

There are many ways to build a successful nuclear program. The recipes may differ in some detail, but the basic ingredients remain the same. A successful program will have first a top management that clearly understands the demanding nature of nuclear technology and is fully committed to support it. Secondly, it must have clearly defined and well understood goals and standards. Third, competent and dedicated and motivated employees who are proud of their company, proud of their profession and who are fully involved in the pursuit of excellence. And fourth, of course, you must have adequate resources to do the job.

Now it does not short change any other part of a utility's operation to say that a company's nuclear plants are by far its most important facilities. Dollars alone make that point. Our company has total assets in excess of 10 billion dollars, and more than a third of that are represented by our two nuclear stations. If our chief executive officer or the other senior executives do not recognize that and are not sufficiently committed to the pursuit of excellence in nuclear operations, our company is in for trouble.

In 1980, Virginia Power was in just that kind of trouble. Our nuclear and fossil plants were performing very poorly; our rates were the highest in our region and they were still rising. Relations with the public and with the legislators and the media and the regulators were about as low as you could get, and the company was indeed in serious financial trouble. Our two nuclear stations, Surry and North Anna, were part of the problem. Surry's steam generators were worn out. North Anna 2 had just completed construction but could not operate because of the licensing moratorium. The three units that were operating had consistently fallen below the national average in operating efficiency. So our first step in performance improvement was to recognize at the very top of the company and throughout the company that we were indeed in trouble, not only in nuclear operations but in most other aspects of our business as well, and to recognize that no-one could save us but ourselves, not the regulators, not the legislatures. We had to do it ourselves.

Finally, a large part of that problem was management. During the 1970's, too often Virginia Power management had taken the attitude towards nuclear power that it was just another source of energy, just a way to boil water. Nuclear operations in our organization at that time was lumped together with our fossil stations as an overall power supply function. As part of our reorganization, then, we made nuclear operations a separate function, headed by a Vice President, and we made it absolutely clear that in the future, nuclear operations was to be given the highest priority within the company, and we set about convincing our nuclear personnel that they were part of something very special for this company.

Of course we increased staffing and we improved working conditions throughout the system. We had many excellent people who were eager and able to improve and adopt new attitudes and to respond to our demand for better performance. To make full use of them, we sharply increased our training efforts, not only in the nuclear area, but throughout the company, but unfortunately there were some who could not or would not adopt and they had to go. We made personnel changes at all levels of management. Now along with these improvements, we worked hard to instill a strong sense of pride in our nuclear personnel, and we had some early successes such as getting the first license for North Anna 2 and some successes in our coal conversion, and they helped us improve our morale. But at the same time, our emphasis was on solid, steady improvement, not on quick fixes. When we made a gain, we wanted to understand how we had done it, why we had done it and what we had done to get where we were, and usually these gains were because the people did it themselves. We changed our attitude towards regulation from one of grudging compliance to willing cooperation and even tried to anticipate the regulatory requirements. We emphasized our commitment to improvement and we admitted our errors and we tried to turn even enforcement conferences into opportunities. At Virginia Power, we applied our policies to employment involvement and challenge and reward across the company. The sense of pride and momentum that we were seeking came not just from nuclear successes, but coal conversions and the fossil improvements and our rate performance became favorable for our area.

Of all the steps that we have taken to improve nuclear performance, the improvement in the attitude and in the quality of our people has counted the most heavily. Most of the gains in performance have resulted from the commitment and attentiveness of capable, well trained people more than from any other factor, and I believe every success story in nuclear performance stems from a similar commitment.

While people as individuals and as a part of the team are the key to success, gains also result from improvements in organization and improvements in procedures and equipment. Like the rest of the US nuclear industry, we spend a lot of money to upgrade facilities and equipment, and the value of the equipment is obvious. But another aspect of facilities upgrade, appearance, is harder to quantify. There's absolutely no doubt in my mind and in our senior management's mind that appearance is just as important as the condition of the equipment. While there are some exceptions, a facility that is well painted and brightly lit and spotlessly clean and with a professional appearance is almost certain to be a good plant. And the reverse is also true more often than not. I believe attitude is strongly influenced by surroundings, and we've spent a lot of money in our company to polish up our facilities on the strength of that belief, and we're convinced that it is paying dividends. It is a big contributor to the culture of pride, professionalism and the belief in the value of each individual's contribution that we have worked to develop at Virginia Power.

We are strongly committed to training throughout the company, but especially in nuclear operations. Our nuclear operators and maintenance personnel spend about 1 hour in every 5 in training, as do personnel throughout the United States. But that compares to probably 1 hour in 20 or 30 that we had in our nuclear operations in the mid-70's. But our emphasis on training is not just a matter of hours spent or the credentials that the people would gain. We want our employees to know that we do not do training as a necessary inconvenience, but we want them to feel that training is a fully integral part of their job. In addition to providing employees with information specifically related to their job, we use the training programs as an opportunity to explain and emphasize the company's philosophies and the company's goals and objectives. We stress the importance of team work and the need to strive for excellence. We try to reinforce in our employees the belief that they are part of something special.

One training program that has been very beneficial to us is our foundations program. We try to recruit people into this foundation program from the brightest students in the high schools local to our area. For some reason or other, they do not intend to go on to college and we work hard to recruit them to come with us. We provide them with a ful scholarship to attend our technical training program. And although we emphasize bright high school students, this program is also open to our current employees. The

course is run in conjunction with a local college, and the graduates of the course receive college credits for their work. This program provides us with good nuclear employees who are tied to the community and therefore more likely to be permanent, and at the same time it builds an awful lot of community support for our company.

Another program that has been very important to the team building concept is the employee involvement process. We want to establish a climate where each employee feels the right, or really the obligation, to make suggestions on how to do his or her job better. These workers form what we call employee involvement teams and analyze problems and propose solutions to their supervisors. At any one time we have 200 to 300 of these employee involvement teams working throughout the company, and a good percentage of them are very active in the nuclear operations department.

Within the nuclear operations department, we have taken this process a step further with what we call quality maintenance teams. This team concept places the primary responsibility for doing the job right on the workers, not on a quality assurance inspector who comes around looking over their shoulders. Our program, our quality maintenance team program, operates from the belief that by creating formalized inspection programs, we've destroyed the workers' pride of craftmanship. If you take people who have spent their whole working lives becoming expert in something and suddenly they can't make a decision about whether or not the job has been done right, instead they have to wait for some third party who generally has less knowledge than them, probably not as much experience and certainly is not as well respected, and he has to come and check it. And we think the result is very predictable. The worker no longer has the same feeling of pride or responsability and the product suffers. Now we wanted to get back the idea that we respect the skills and knowledge of our workers and expect them to do it right the first time, without somebody looking over their shoulders at every step and therefore without rework and without problems when the plant comes back on line. We have established these teams throughout our maintenance employees at each nuclear station and they've been given special training in health physics, in reological protection and special training to qualify and certify each individual as a QC inspector. These teams then are responsible for planning and carrying out the job and for performing their own health physics coverage and for providing the basic QC inspections. Now all of this met with a lot of skepticism at first, but the concept is really catching on. The results we are seeing are better work, less exposure and fewer man-hours to do the work. But what we are seeing that really is the most satisfying is a solid commitment by the employee to insure that the work constantly improves. We intend to carefully expand this program to other workers. Last year we included the instrumentation and control group in this team concept.

Now so far I have concentrated in this talk on the management issues rather than on the maintenance and hardware issues, because, frankly, maintenance and hardware upgrades have not been that much of a problem. We put a lot of time on predictive and preventive maintenance, and we've kept up with all of the changes required by the NRC after TMI. What we do we do very well. However, our recent experience at Surry drove home to us the fact that our world is constantly changing and we must continuously ask ourselves not only are we doing things right but are we doing the right things. We could have fixed the immediate problems at Surry and put these two units back on line last fall sometime, but we came to the conclusion that the rash of problems was a symptom of a broader problem that could threaten our ability to climb and continue to improve into what we would like to be in the top ranks of the nuclear performers. We determined to continue, then, the Surry outages as long as it was necessary to take care of not only the short-term problems but to prepare the plant to meet the highest standards for safety and long-term operability.

And, we stopped for a fresh look at our nuclear operations management to determine what we needed to enable our organization to function at higher levels. As a result, we made some organizational changes, and we made some changes to operating procedures, and more important we have adopted a new and better operating philosophy. This philosophy focuses on unity of command, full accountability and a renewed and increased commitment to excellence. The unity of command aspect of the new philosophy is being accomplished through a new management structure for Virginia Power's nuclear operations department that will assure that both nuclear stations receive intensified management attention. Several members of the company's senior management will be devoting all of their time to nuclear issues until these major operational changes are completed. In addition, several new high-level positions have been created, principally to focus on long-term nuclear operations support activities.

We have heard that management means action and means long-term planning and implementation, not reaction, and I think what we learned last fall at Virginia Power was that for the last two or three years, we have been reacting. The company also made a long-term commitment to configuration management to address overall design-related issues, and this stems from the fact that nuclear utilities are subject to increasingly high levels of regulatory compliance in the areas of design basis documentation. Toda's standards certainly far exceed the design and operating requirements that were in effect when our first Surry Unit came on line more than seventeen years ago.

Our renewed commitment to excellence, then, is embodied in an aggressive program that we have implemented to bring Surry back to the level of performance it achieved in the mid-1980's. In addition to the organizational changes and the enhancement of sensitivity, internal and external communications and problem reporting processes, we've also revised our preventive maintenance program. We've improved the maintenance and training process, we've upgraded some equipment, and we've initiated an operational assurance program. In short, we've done what we think we have to do to get Surry back on track.

At the start of the 1980's, then, Virginia Power made a commitment to excellence and has placed us, we believe, among the leaders of investor-owned generators of nuclear power, and we put together a program based on these four ingredients that I mentioned earlier: management commitment, clearly defined goals and standards, capable and motivated employees and adequate resources. And these ingredients are still in place. But I guess the main lesson that our recent experience has taught us is that no matter how good your ingredients are, every once in awhile you have to stir them up a little bit. And that's what we're doing now, and it's given us the momentum to get back on track and to get better.

PRACTICAL EXPERIENCE IN NPP's

I would like to bring you a rather brief message about two general lessons that we have learned in Virginia Power while operating our Nuclear Power Stations. Our experience has taught us to know when the changes or modifications are really necessary and even more importantly, we believe our experience has taught us to know when they are not necessary. In our first six years of operation in the mid-70's, our power stations compiled a very uneven record of performance. Some of it was related to hardware, but some of it was related to attitude. In 1979, we were forced to replace the steam generators at our Surry Unit 2 after only 6 years of operation, and starting the next year we replaced the steam generators in Surry Unit 1.

The degradation of those steam generators was not only a hardware problem. It reflected a basic attitude problem towards nuclear operations that we had, and we changed both the hardware and the attitude in 1979 and 1980 and 1981, and these units have worked well for us since then.

Our other major program of hardware change has been the backfitting of numerous systems that followed the Three Mile Island accident. That backfit was mandated by the NRC, and of course most operators of nuclear units have done similar backfitting. I think that many of us would agree that in our industry's haste to modify plants after the TMI accident, that nuclear safety has indeed been compromised, at some time and in some instances by making these systems more complicated than they need to be and by not taking adequate time to analyze properly the change or the impact of the change to one system on the performance of other systems. Now, this was not solely the fault of the NRC. The accident at Three Mile Island made many utilities too willing to implement new technology on the theory that any change would upgrade the plant and any change would improve performance. In fact, we believe the opposite may be true. There is considerable evidence in our nuclear industry figures that there is an inverse correlation between a utility's nuclear expenditures and its performance. In some instances, we have data that shows that the utilities who are spending the most money on their nuclear program are achieving some of the poorest results.

Now, as a result of our experience, and with the mixed results that we have received even from our changes, we now have adopted an attitude of looking hard at reducing changes in our nuclear plants. That is the first point I would want to make, is that it's not necessary to just continually make changes to have good plant performance. We believe that excessive change in a nuclear plant, or busyness we call it, just plain busyness, has a disruptive effect on operations. Now, when we compare the marginal benefit and performance that we gain from the installation of new hardware, when we compare that with the cost in downtime for the installation, with the necessary effort in retraining and the initial reduction in performance that we often see shile the operators are becoming accustomed to new equipment, we often arrive at the conclusion that the change is not worth making. It is not an economic conclusion, it is a performance conclusion. We have adopted an attitude we call health care; replacement only when necessary. Let me explain health care a little bit and where it came from. As people, when we are sick or when we have a problem, we go someplace and get it fixed and have it worked on, but as people, if we're not quite as good as our neighbor or do not run quite as fast, or we are not quite as good looking, we do not go to the cosmetic surgeon and get fixed up that way. We fix ourselves to keep ourselves well, and that is the attitude that we have adopted for our nuclear stations-health care. When a component or a system is completing its life span or if it is performing poorly, then we look to fix it or replace it. And at that point, we look at all of the available technology to see if we cannot achieve yet some improvements over our basic design. An example: we recently changed our feedwater steam heaters at all four of our units. These steam heaters were performing poorly, so we changed them out, but we upgraded the tubing, we upgraded the heat transfer, we replaced the copper with steel to reduce the corrosion effect and to improve the performance of our steam generators, but we made it only when the overall system needed upgrading, not just because it was a better way to do it.

This is not to say that we decline to make changes under any circumstances. We continually work to eliminate and modify equipment that malfunctions too frequently. Snubbers, for example, are a good example of this. Snubbers at our units require constant and expensive inspection and they require a lot of maintenance, and when recently there was an advance in technology, leak before break, that allowed us to eliminate many of these snubbers with no adverse impact on our ability to withstand seismic events, we did so. It was a modification that was costly in time, costly in dose; however, it was an improvement that was needed due to the huge investment we were making in time and dose already.

The second area that I would talk about is human error. Human error, as well as equipment troubles, creates problems. One area that we do not hesitate to upgrade at any time is the quality of our people. You know, at other times in these meetings, we've heard details about successful efforts to develop team spirit and to develop pride of craftmanship. Another example that I would mention is one of our programs to reduce human error, is the human performance evaluation system, HPES. We heard a little bit about this earlier in the Meetings. HPES identifies the causes of errors and attempts to correct them through training changes, through procedural changes and often, or sometimes at least, it leads to equipment redesign. At our stations, these human errors are reported anonomously so that they can be addressed without assigning blame. Virginia Power began the human performance evaluation system as a pilot program with the INPO, Institute of Nuclear Power Operations, and it has been very successful for us and is now being adopted more widely throughout our industry. Experience is a very valuable commodity in the operation of a nuclear facility and we place a premium on it.

An observation I might make, a recent study conducted by our U.S. Department of Energy countered the assertion that older plants are more expensive to operate. The study found that as plants aged, the real operations and maintenance costs actually declined somewhat. This Department of Energy study attributed the drop in cost to the experience gained by the operators over time. We believe that this is real, we believe in that, and we look carefully at what we are doing to our plants. The sense of pride that we have fostered among our emplyees has been a factor in achieving stability in the work force. In addition, we are careful with our hiring and training and try hard to produce employees who will stay with us so that we can take the advantage of their experience.

Our regard for experience goes beyond our own employees. One of our objectives is to achieve the same level of excellence from our contractors. This is the focus of some of our incentive-based contracts that we have recently signed. One of them is for reological services. We signed a contract in January of last year which covers the health physics and decontamination services at both of our nuclear stations. Briefly what we had found from our experience was that in each refueling outage, we were dealing with new contractors, and we were supplied with new reological services technicians, who likely had never seen our facilities before. We also found that they were not up to speed with our standards, and when we needed the technicians, so did many of the other utilities, and sometimes we were very short of people. So we signed a contract for an initial period of 3 years to provide these reological services. Part of the incentive structure, then, in this contract is based on the return of the same technicians who have worked for us in previous outages. This approach stresses experience and team work that we value in our own employees. When a contract employee does not meet our standards, he is not invited back and of course this affects the incentive that goes with that contract.

Our experience, then, in seventeen years as a nuclear operator has taught us many things. It has taught us to make changes in hardware unhesitatingly when they are needed, but not to make changes without a very good reason. It has taught us that a dedicated and a competent and a professional work force is by far the most important component of safe and efficient nuclear operations. And most important, our experience has taught us the value of experience.